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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/664,017	09/17/2003	Emanuel I. Cooper	YOR920020297US1 (20140/02	2762

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EXAMINER	
BARRECA, NICOLE M	

ART UNIT	PAPER NUMBER
1756	

DATE MAILED: 07/12/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/664,017	COOPER ET AL.	
	Examiner	Art Unit	
	Nicole M. Barreca	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 May 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-39* is/are pending in the application.

4a) Of the above claim(s) *19 and 22-39* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-18,20 and 21* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *5/19/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Applicant's election of Group I, claims 1-18 and 20-21 in the reply filed on 5/19/05 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).

2. Claims 19 and 22-39 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected inventions, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 5/19/05.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 7 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 7 is indefinite to whether the weak or strong complexant is meant to comprise ammonia.

Claim Rejections - 35 USC § 102/ USC § 103

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

> applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. Claims 1-8 are rejected under 35 U.S.C. 102(e) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Mikhaylich (US 6,537,381).

8. A chemical cleaning solution is applied to the surface of a copper layer (step a). The solution causes the top layer of the copper to form copper oxide. The copper material is transformed into a water soluble form in order to remove in a controlled amount the copper from the surface of the wafer. The wafer is rinsed to remove the water soluble copper and then may be stored (step b). The solution includes an oxidizing agent such as hydrogen peroxide and a strong chelating agent in combination with a weak chelating agent. The preferred solution contains 0.035-0.21 wt% NH4OH (weak), 0.005-0.03 wt% EDTA (strong), H2O2 and deionized water. The ratio of H2O2 and DI water by volume is between 1:30 and 1:200. See col.5, 5-col.6, 42 and Fig.4A. While the reference silent on cumulative stability constant of the complexants with copper, the cumulative stability constant is an inherent property of compound. Therefore one of ordinary skill in the art would have to expect that the cumulative stability constants were within the applicant's claimed range as the reference discloses some of the same complexing compounds as the applicant.

9. Claims 1, 2, 5-8, 11-18, 20, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zeblisky (US 3,809,588) in view of Aoki (US 6,787,480).

10. Copper is etched in the production of printed circuit boards. Copper is formed on a substrate such as a plastic sheet or fiber sheet impregnated with a bonding material such as phenolic resin and masked with a resist material to form pattern areas which later become the circuit (col.1, 21-35). An etching solution includes a peroxy-containing compound (oxidant) at 0.1 wt% to saturation, such as 25 wt%, a complexing agent such as ammonium hydroxide (weak complexant) at an amount sufficient to complex the oxidized copper, and a stabilizing agent (strong complexant) such as (tetrasodium) ethylenediamine tetraacetic acid at 0.01% to about 75% wt. While the reference silent on cumulative stability constant of the complexants with copper, the cumulative stability constant is an inherent property of compound. Therefore one of ordinary skill in the art would have to expect that the cumulative stability constants were within the applicant's claimed range as the reference discloses some of the same compounds as the applicant. The aqueous etching solution has a pH of more than 7 and less than 13. At least 0.5 mole of peroxy-containing compound should be employed per mole to metallic copper to oxidize the copper. Cu^{++} ions are formed. Water is the preferred solvent. See col.2, 3-72, col.4, 17-75. Zeblisky teaches a method for etching copper and discloses that the etching solution oxidizes the copper, but does not disclose removing the oxidized layer with a non-oxidizing composition. Aoki teaches that copper oxide is formed when copper interconnections are made and that it is essential to remove this copper oxide layer formed on the copper surface, such as by using carboxylic acid

cleaning solution, in order to prevent the electrical resistance from increasing (col.1, 29-45). It would have been obvious to one of ordinary skill in the art to remove the copper oxide layer formed on the copper surface, such as by using carboxylic acid cleaning solution, in the method of Zeblisky because Aoki teaches that this is essential in order to prevent the electrical resistance from increasing.

11. Claims 1-8, 11-18 and 20-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okinaka (US 4,349,411) in view of Aoki.

12. Okinaka discloses a method for the etching of aluminum-copper alloy. Masks such as photoresists are used where the etching procedure is confined to specific areas. The Al-Cu alloy is etched using an alkaline aqueous etch solution comprising oxidizing agent, complexing agent, surfactant and alkaline agent sufficient to make the pH at least 10. Typical oxidizing agents include hydrogen peroxide and perborate. Solution concentrations from 0.001 molar to saturation are preferred. Specific examples include ammonia and ethylenediamine tetraacetic acid and salts. See Table 1 for specific amounts of the reagents. While the reference does not explicitly disclose using a mixture of a weak and strong complexing agent, it does teach complexing agents for copper are well known and the selection of particular complexing agents depends on economic considerations, availability, compatibility with other compounds in the etching solution or materials being etched and etch rates. It would have been within the ordinary skill of one in the art to determine the complexing agents as required depending on the specific etching conditions. While the reference silent on cumulative stability constant of the complexants with copper, the cumulative stability constant is an

inherent property of compound. Therefore one of ordinary skill in the art would have to expect that the cumulative stability constants were within the applicant's claimed range as the reference discloses some of the same compounds as the applicant. See col.1, 65-col.3, 46. Okinaka teaches a method for etching copper and discloses that the etching solution includes an oxidizing agent, but does not disclose removing the oxidized layer with a non-oxidizing composition. Aoki teaches that copper oxide is formed when copper interconnections are made and that it is essential to remove this copper oxide layer formed on the copper surface, such as by using carboxylic acid cleaning solution, in order to prevent the electrical resistance from increasing (col.1, 29-45). It would have been obvious to one of ordinary skill in the art to remove the copper oxide layer formed on the copper surface, such as by using carboxylic acid cleaning solution, in the method of Okinaka because Aoki teaches that this is essential in order to prevent the electrical resistance from increasing.

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Uozumi (US 6,261,953) discloses a method for forming a copper oxide film to etch a copper surface evenly.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 571-272-1379. The examiner can normally be reached on Monday-Thursday (9AM-7PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F. Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nicole M Barreca
Primary Examiner
Art Unit 1756

7/7/05